

## Module 4 - Strain Gauges

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering

Tennessee Technological University

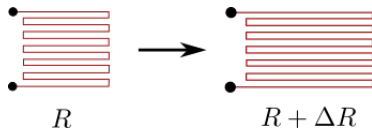
### Topic 2 - The Wheatstone Bridge

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- Resistive Gauges
- The Bridge Circuit
- Balancing the Bridge
- Gauge Sensitivity

## Resistive Gauges

The resistive strain gauge, aka \_\_\_\_\_, is bonded to the surface so that it deforms with the specimen. The change in length of the bonded gauge causes a change in resistance which is used as a \_\_\_\_\_.

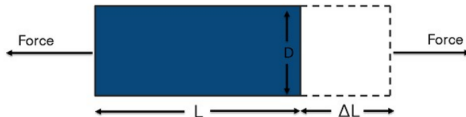


Images: T.Hill

## Resistive Gauges

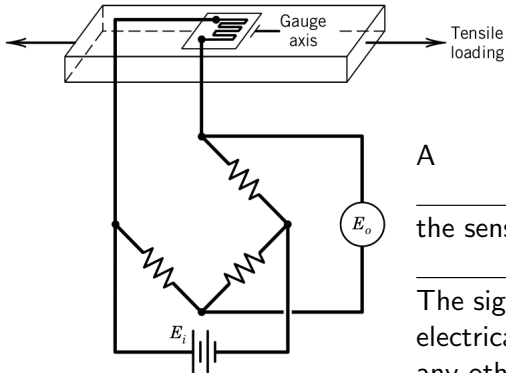
The \_\_\_\_\_ is typically used instead of the physical parameters.

This number relates the relative change in resistance to the measured strain.



Images: NI

# The Bridge Circuit



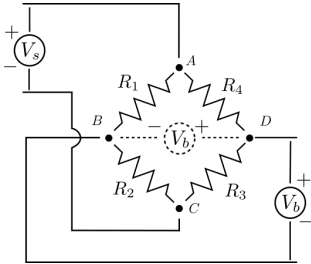
A

\_\_\_\_\_ converts  
the sensed information into a

\_\_\_\_\_

The signal might be mechanical,  
electrical, optical, or may take  
any other form that can be  
meaningfully recorded.

# The Bridge Circuit



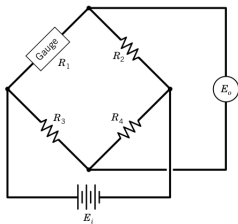
Images: T.Hill

How does the bridge circuit work as a transducer?

Use KVL and the voltage divider rule find the relationship between the two voltages.

## Balancing the Bridge

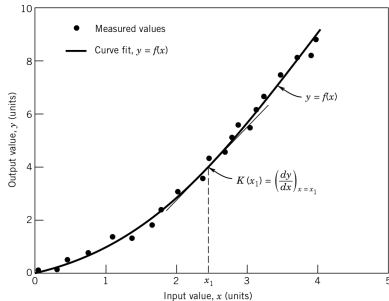
If all four resistors are equal the bridge voltage will equal zero and the bridge is said to be **balanced**. One or more resistors in the circuit is replaced by a strain gauge and bridge voltage is used as a measure of change in resistance and therefore strain.



This gives a linear **calibration curve** with a convenient **zero offset**.

Text. Images: Theory and Design for Mechanical Measurements

# Gauge Sensitivity



Assume  $R = 120\Omega$  for all resistors and the bridge is balanced in a condition of zero strain. What is the **static sensitivity** of the gauge and bridge circuit described?

$K =$

Text. Images: Theory and Design for Mechanical Measurements



# Gauge Sensitivity

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